Bonneville Power Administration
Fish and Wildlife Program FY99 Proposal Form

Section 1. General administrative information

Mitigation for Excessive Drawdowns: Hungry Horse Dam Component

Bonneville project number, if an ongoing project 9401002

Business name of agency, institution or organization requesting funding
Montana Fish, Wildlife & Parks and the Confederated Salish and Kootenai Tribes

Business acronym (if appropriate) MFWP and CSKT

Proposal contact person or principal investigator:

Name	Brian Marotz, Rick Malta
Mailing Address	490 N. Meridian Rd.
City, ST Zip	Kalispell, MT 59901
Phone	(406) 751-4546, (406) 751-4545
Fax	(406) 257-0349
Email address	marotz@digisys.net, prmalta@digisys.net

Subcontractors.

Organization	Mailing Address	City, ST Zip	Contact Name
MFWP - Hungry Horse Mitigation Project*	490 N. Meridian Rd.	Kalispell, MT 59901	Ladd Knotek
Instream Flow Incremental Methodology (IFIM) Project*	490 N. Meridian Rd.	Kalispell, MT 59901	Brian Marotz

* Joint sponsors on certain individual projects. See Section 3 below.

We will be subcontracting private consultants and heavy equipment operation for the creation of the shallow impoundment basins in upper Hungry Horse Reservoir as well as bull trout habitat improvement actions in streams adjacent to Hungry Horse Reservoir. The State of Montana requires a formal bid process to select vendors. Upon selection of the successful bids, a detailed sub-contract will be submitted to BPA.

This project has formalized cost-share agreements with the U.S. Forest Service, U.S. Bureau of Reclamation, the State of Montana and National Fish and Wildlife Foundation. BPA partially funded fish passage improvement projects on seven tributaries to Hungry Horse Reservoir which will be maintained by the Forest Service.

NPPC Program Measure Number(s) which this project addresses.
903(a), 903(b), (NPPC 1987), 10.1B, 10.1C, 10.2A.2, 10.2B, 10.3A.1-4, 10.3A.6, 10.3A9, 10.3A11, 10.3A.18 (NPPC1995)

NMFS Biological Opinion Number(s) which this project addresses.

Bull Trout Proposed ESA Listing (62 FR 32268)
Bull trout and westslope cutthroat trout recovery plans and actions (Montana Bull Trout Restoration Team 1997; Montana Bull Trout Scientific Group 1995; MFWP and CSKT 1991, 1993; Montana Westslope Cutthroat Trout Recovery Team, in prep.)
NMFS Hydrosystem Operations for Salmon Recovery (56 FR 58619; 57 FR 14653)

Other planning document references.

PLANNING DOCUMENTS: Fisheries Losses Attributable to Reservoir Drawdown In Excess of Limits Stated in the Columbia Basin Fish and Wildlife Program: Hungry Horse and Libby Dams 1987-1991 (Marotz and DosSantos 1993), Fisheries Losses Attributable to Reservoir Drawdown In Excess of Limits in the Columbia Basin Fish and Wildlife Program: Hungry Horse and Libby Dams 1991-1993 (MFWP and CSKT 1997), Fisheries Mitigation Plan for Losses Attributable to the Construction and Operation of Hungry Horse Dam (MFWP & CSKT 1993), Fish Passage and Habitat Improvement in the Upper Flathead River Basin (Knotek et al. 1997), Montana Bull Trout Restoration Plan (Montana Bull Trout Restoration Team 1997), Montana Westslope Cutthroat Trout Restoration Plan, In Prep), Monitoring Master Plan for the Flathead Basin (Flathead Basin Commission 1985), Forest Plan: Flathead National Forest (Brannon 1985), Montana Stream Preservation Act (1963), Natural Streambed and Land Preservation Act (1975), Water Quality Data and Analysis to Aid in the Development of Revised Water Quality Targets for Flathead Lake , Montana (Stanford et al. 1997).

SUPPORT GROUPS AND DOCUMENTS: Flathead Basin Commission Biennial Report 1995-96 (Flathead Basin Commission 1997), Flathead River Drainage Bull Trout Status Report (Montana Bull Trout Scientific Group 1995a), South Fork Flathead River Drainage Bull Trout Status Report (Montana Bull Trout Scientific Group 1995b).

Subbasin.

Flathead Subbasin, Upper Columbia. Work is occurring in the North Fork of the Flathead River and tributaries (Whale Creek, Trail Creek, Big Creek, Coal Creek), Middle Fork of the Flathead River, South Fork of the Flathead River and tributaries (Wounded Buck, Wheeler Creek, Sullivan Creek, Quintonkin Creek, Crossover Creek, Emery Creek), main

stem of the Flathead River and tributaries (Trumble Creek, Whitefish River, Stillwater River, Ashley Creek, Mill Creek, Rose Creek, Elliot Creek).

Short description.

Determine how regulated flow and temperatures below Hungry Horse Dam influence predator-prey interactions and survival of native trout in the Flathead River. Evaluate effects of thermal control using selective withdrawal. Improve habitat for bull trout and westslope cutthroat trout.

Section 2. Key words

Mark	Programmatic Categories	Mark	Activities	Mark	Project Types
	Anadromous fish	*	Construction	*	Watershed
X	Resident fish	*	O & M	*	Biodiversity/genetics
	Wildlife		Production	*	Population dynamics
	Oceans/estuaries	*	Research	X	Ecosystems
	Climate	X	Monitoring/eval.	*	Flow/survival
	Other	*	Resource mgmt		Fish disease
			Planning/admin.		Supplementation
			Enforcement		Wildlife habitat en-
			Acquisitions		hancement/restoration

Other keywords.

Predation, Native/Non-native Species Interactions, Hydrodynamics, Habitat Improvement.

Section 3. Relationships to other Bonneville projects

Project #	Project title/description	Nature of relationship
9101903	Hungry Horse Dam Selective Withdrawal (BOR)	Defines operation of control gates on Hungry Horse Dam selective withdrawal structure to reduce zooplankton entrainment while

		matching temperature targets in the river downstream.
9101903	Hungry Horse Dam Mitigation Project (BPA)	Cooperative efforts towards native species recovery through habitat improvement efforts and watershed monitoring.
9502500	Instream Flow Incremental Methodology (BPA)	Conducts physical habitat inventory to calibrate IFIM models. Provides a model framework enabling maximal use of biological data from this project (9401000). Field data are exchanged between these cooperative projects,
9608701	Focus Watershed Coordination - Flathead River (BPA)	Serves as a liaison between watershed efforts.
3874700	Streamnet Geographical Information Services Unit	Provides GIS and GPS support for design, modification, and archive of watershed maps resulting from projects 9401000 and 9101903.

Section 4. Objectives, tasks and schedules

Objectives and tasks

Obj 1,2,3	Objective	Task a,b,c	Task
1	Assess abundance, distribution, movements, and food habits of lake trout in the main stem, north fork, and middle fork of the Flathead River.	a	Capture lake trout using nets, traps, setlines, angling, angler harvest and electrofishing apparatus.
		b	Surgically implant radio-transmitters into lake trout to track movements. A maximum of 35 radio-tagged fish will be maintained in the system for the duration of this objective.
		c	Maintain three radio-telemetry ground stations along the Flathead River to monitor movements of radio-tagged fish.
		d	Collect data on lake trout distribution, movements and habitat use through weekly aerial

			surveys of radio-tagged fish.
		e	Correlate flows and water temperature with the occurrence of lake trout.
		f	Obtain growth information (lengths/weights, otoliths/scales) and stomach contents from lake trout harvested by anglers.
		g	Collect tissue samples from Flathead River lake trout and Glacier National Park lake trout for identification as possible disjunct populations through genetic analysis.
2	Assess distribution and movements of juvenile and sub-adult bull trout in the main stem, north fork, and middle fork of the Flathead River.	a	Capture bull trout using migrant traps and angling.
		b	Surgically implant radio-transmitters into juvenile and sub-adult bull trout to track movements. A maximum of 30 radio-tagged fish will be maintained in the system for the duration of this objective.
		c	In conjunction with lake trout monitoring, maintain three radio-telemetry ground stations along the Flathead river to monitor movements of radio-tagged fish.
		d	In conjunction with lake trout monitoring, collect data on bull trout distribution, movement and habitat use through weekly aerial surveys of radio-tagged fish.
		e	Correlate flows and water temperatures with movements and distribution of bull trout.
		f	Correlate bull trout/lake trout movements, distribution and habitat use.
3	Assess distribution and movements of sub-adult and	a	Capture cutthroat trout using nets, traps, setlines and angling.

	adult westslope cutthroat trout in the main stem, north fork, and middle fork of the Flathead River.		
		b	Surgically implant radio-transmitters into sub-adult and adult cutthroat to track movements. A maximum of 30 radio-tagged fish will be maintained in the system for the duration of this objective.
		c	In conjunction with lake trout and bull trout monitoring, maintain three radio-telemetry ground stations along the Flathead River to monitor movements of radio-tagged fish.
		d	In conjunction with lake trout and bull trout monitoring, collect data on westslope cutthroat trout distribution, movements and habitat use through weekly aerial surveys of radio-tagged fish.
		e	Correlate flows and water temperature with movements and distribution of westslope cutthroat trout.
		f	Correlate cutthroat trout/lake trout movements, distribution, and habitat use.
4	Conduct westslope cutthroat trout population assessments in the south, middle, and north forks of the Flathead River in cooperation with MFWP management staff and Hungry Horse Dam Mitigation Crew.	a	Capture and mark westslope cutthroat trout through angling or other means.
		b	Tag captured westslope cutthroat trout with colored crustacea tags and release.
		c	Recapture marked fish by snorkeling established transects.
5	Assess movements, distribution and food habits of predators in	a	Capture northern pike and largemouth bass using nets, traps,

	Halfmoon, Church, and Fennon Sloughs and in the main stem Flathead River.		setlines, angler harvests and electrofishing apparatus.
		b	Surgically implant radio-transmitters into northern pike and largemouth bass to track movements. A maximum of four radio-tagged fish of each species per slough will be maintained for the duration of this objective.
		c	Floy tag and release fish not implanted with transmitters.
		d	In conjunction with other radio-telemetry flights, collect data on fish distribution, movements and habitat use through weekly aerial surveys of radio-tagged fish.
		e	Obtain growth information (lengths/ weights, otoliths/scales) and stomach contents from harvested northern pike and largemouth bass. Stomach pump live specimens which may still be released.
		f	Correlate predators/bull trout and westslope cutthroat trout movements and habitat use.
6	Create shallow impoundment basins in the upper reaches of Hungry Horse Reservoir in cooperation with BOR and Hungry Horse Dam Mitigation Crew to increase the production of macro-invertebrates.	a	Locate and map sites for construction of shallow impoundment basins in the upper reaches of Hungry Horse Reservoir.
		b	Develop site-specific designs for construction of basins at sites identified above.
		c	Develop plans for construction of impoundment basins at each location. Determine access for heavy equipment, estimate revegetation needs, and begin procedures.
		d	Prepare EA's, 124 and 3A permits

			for selected sites.
		e	Initiate contracts for heavy equipment operators and develop timeline for project completion.
		f	Establish photo-points for pre- and post-impoundment construction.
7	Collect species micro-habitat data required by the Instream Flow Incremental Methodology (IFIM) Project (BPA #9502500) on the Flathead River.	a	Assist IFIM Project in locating and documenting habitat parameters for use in developing weighted useable area curves.
		b	Provide radio-locations from lake trout, bull trout, westslope cutthroat trout, and other species for use in mapping species distributions.
8	Monitor spawning kokanee salmon runs in the main stem Flathead River.	a	Survey historic monitoring sites for spawning kokanee salmon periodically September through December.
		b	Enumerate fish located.
9	Map Flathead River and sloughs using Global Positioning System (GPS) to be conducted in cooperation with Montana Rivers Information System MRIS)	a	Using GPS portable receiver, map the main stem Flathead River and associated sloughs. Data to be shared with MRIS for creation of modern and accurate maps replacing USGS quad maps of the 1960's and 1970's. Physical attributes will be collected in cooperation with IFIM Project (BPA #9502500)
		b	Identify and map channel changes, mass wasting of river banks, and past rip rap projects for future replacement and improvements.
10	Examination of habitat improvement potential and project design in the main stem Flathead River to be conducted in cooperation with MFWP's Urban Fishery Program.	a	Locate and map areas of Rose Creek for creation of step impoundments.
		b	Identify and map areas of degraded habitat (collapsed banks, barriers, accumulated silt deposits,

			etc).
		c	Develop site-specific design for area to become part of State of Montana's Urban Fishery Program.
		d	Establish pre-modification photo-points.
11	Examination of habitat improvement potential and project design in bull trout and westslope cutthroat trout spawning and rearing streams to be conducted in cooperation with Hungry Horse Dam Mitigation Crew.	a	Identify and map point sources of sedimentation upstream of spawning areas in Wounded Buck, Wheeler, Sullivan and Quintonkin Creeks.
		b	Locate and map areas of degraded rearing habitat (collapsed banks, barriers, pools filled with bedload, accumulated silt deposits, etc) in the above streams.
		c	In cooperation with the BOR Technical Assistance Program, develop site-specific habitat improvement designs for situations identified above which offer the greatest potential benefit.
		d	Assist BOR in developing site plans for habitat improvement at each location, determine access for heavy equipment, design channel reconstruction plans, estimate revegetation needs for bank stabilization, locate positions for woody debris installation and begin purchase procedures.
		e	Establish photo-points for pre- and post-modification monitoring.
		f	Conduct pre- and post-modification redd counts and core sampling.
12	Implement selected actions determined in Objective 11.	a	Prepare EA's, 124, and 3A permits for selected high priority sites.
		b	Initiate contracts for heavy equipment operators and develop

			timeline for project completion.
		c	Install devices that accumulate woody debris to create an erosion barrier along the upstream bank of mass wasting banks and prepare the newly protected toe for revegetation.
		d	Install vegetation mats, plant seeds and rooted stock, trench in wattling bundles on the restabilized bank above the toe.
		e	Establish riparian vegetation in newly stabilized or denuded banks.
		f	Position woody debris structures in designated areas to create pools and gravel deposition areas.
		g	Implement habitat improvement work concurrent with road obliteration at Emery Creek.
		h	Monitor success of various improvements for adaptive management and maintenance (photo points, cost-effectiveness evaluations, etc)

Objective schedules and costs

Objective #	Start Date mm/yyyy	End Date mm/yyyy	Cost %
1	12/1994	12/1999	10.00%
2	07/1997	01/2001	13.00%
3	01/1998	06/2001	13.00%
4	08/1997	08/2001	2.00%
5	04/1997	12/1999	4.00%
6	05/1997	11/2000	6.00%
7	06/1998	11/2000	5.00%
8	10/1997	12/1998	1.00%
9	04/2000	11/2001	12.00%
10	04/2000	12/2001	10.00%
11	06/1995	11/2001	11.00%
12	04/1999	11/2001	13.00%

Schedule constraints.

Achievement of stated objectives on schedule are dependent upon CBFWA prioritization, NPPC approval, subcontracting processes, permitting processes, unanticipated BPA schedule and timeline changes and major weather events. Project schedule changes are the norm rather than the exception due to many variables beyond our control making prioritization of tasks an adaptive process. Some objectives proceed more quickly than anticipated and others more slowly. It is anticipated this project will proceed on schedule.

Completion date.
2002

Section 5. Budget

FY99 budget by line item

Item	Note	FY99
Personnel	3.0 FTE	$64,465
Fringe benefits		21,140
Supplies, materials, non-expendable property	Field sampling, radio telemetry, habitat improvement, monitoring, gasoline, lab supplies.	12,255
Operations & maintenance	Communications, rent, equipment repair, and maintenance.	27,340
Capital acquisitions or improvements (e.g. land, buildings, major equip.)	Radio-transmitters (40), one data logging receiver and associated equipment.	21,600
PIT tags	# of tags:	0
Travel	Mileage (13,500 miles @ .31/mile); per diem (45 nights @ $12.00/day, 90 days @ $23.00, 325 employees days @ $18.00)	12,645
Indirect costs	Overhead 17,2%, minus equipment	33,290
Subcontracts	Bull trout and westslope cutthroat trout habitat assessment, site selection, prioritization, and implementation. Reservoir subimpoundment basins. Emery Creek habitat improvements and road obliteration. Revegetation.	55,700
Other		0
TOTAL		$248,435

Outyear costs

Outyear costs	FY2000	FY01	FY02	FY03
Total budget	250,000	250,000	250,000	NA
O&M as % of total	50.0%	50.0%	50.0%	NA

Section 6. Abstract

Extreme reservoir drawdown impacts all biological trophic levels as the pool volume shrinks, and reduces the probability that the reservoir will refill during spring runoff. Refill failures are especially harmful to the fishery resource during productive warm months. Resulting discharges influence biological productivity in the Flathead River downstream. Dam operation and other anthropogenic factors have resulted in population declines in native fish species. Bull trout are proposed for listing under the Endangered Species Act in the upper Columbia Basin (encompassing the entire Flathead Basin). Westslope cutthroat have also been petitioned for listing. This project executes research and mitigative actions designed to improve survival and growth of these fish species. Habitat improvement efforts proposed for tributary streams will improve natural reproduction and rearing. A cooperative wetland creation effort in the reservoir viral zone enhances food production and juvenile security habitat. Research and biological sampling in the Flathead River will correlate seasonal distribution, movements and predator-prey interactions with river flow and temperature. Results from these objectives complement and extend related IFIM and thermodynamics modeling (projects 9402500 and 8346500) and Hungry Horse Mitigation Program (project 9401903). Cooperative projects were designed to improve survival and growth of native trout by modifying environmental conditions in the Flathead Watershed. These objectives are expected to be completed within the time-frame of this proposal. Results will be evaluated objective-by-objective. Habitat objectives will be evaluated by post improvement monitoring. Research objectives will be evaluated by monitoring the effects of selective withdrawal on species interactions in the river.

Section 7. Project description

a. Technical and/or scientific background.

Westslope cutthroat trout have been petitioned for listing under the Endangered species Act as threatened. Bull trout in the Columbia River basin have ben proposed for listing as threatened under the Endangered Species Act, which includes western Montana. Populations of these two native species have steadily declined in recent years. This has prompted the need to identify and address the factors causing these declines. Fishery managers are able to directly manipulate temperature, flow, habitat or harvest in order to affect populations in the Flathead System. This project is investigating the potential for altering predator-prey interactions in the Flathead River by manipulating temperature and flow from Hungry Horse Dam. Juvenile bull trout and westslope cutthroat trout migrate from their natal tributaries in the upper reaches of the system to Flathead Lake where they mature. Little is known how these young fish utilize the river, but once they enter the main stem they must pass through a virtual gauntlet or “predator trap” consisting numerous native (northern squawfish) and non-native (lake trout and northern pike) predators.

The incidence of lake trout entering the Flathead River was rarely observed prior to 1989. The non-native lake trout are now frequently observed in the river. The stomach contents of this effective predator contain juvenile cutthroat and bull trout. Concurrent with the lake trout invasion of the river, bull trout redd counts have declined precipitously. Creel and annual gill net monitoring suggests a similar decline in cutthroat inhabiting Flathead Lake and the river system. It may be possible to reduce lake trout numbers in the Flathead River during the summer by using selective withdrawal (intentionally releasing warmer water) from Hungry Horse Reservoir. Temperatures in excess of the preferred tolerance range for lake trout may influence their distribution and movements thereby reducing predator-prey interactions during the critical time when juvenile trout are emigrating from their natal tributaries. This objective began in 1995, providing baseline data prior to the installation and scheduled operation of the selective withdrawal structure in August of 1995. The structure was operational its first full-year in 1996. Post selective withdrawal activities for this objective will be completed by the fall of 1999, with radio-location collection continuing through the fall of 2000.

Information on bull trout status, adult spawning and juvenile rearing in tributary streams as well as adult and sub-adult stages in Flathead Lake, is fairly well documented. However, data on habitat utilization and migratory patterns of juveniles and sub-adult bull trout in the main stem of the Flathead River corridor is lacking. Radio-telemetry will allow assessment of juvenile and sub-adult bull trout movement and distribution within the main stem of the Flathead River.

Merwin traps were deployed in Halfmoon, Church and Fennon Sloughs in May and June of 1995 and 1996. Juvenile and sub-adult bull trout were captured incidentally to sampling for lake tout. This was the first documented use of Flathead River sloughs by these life-history stages of bull trout. All three sloughs are believed to have abundant populations of northern pike, largemouth bass and northern squawfish. Tagging studies have documented the movement of these predators between sloughs by way of the Flathead River main stem. Hydro regulation has created lake-like conditions in the lower 20-miles of the Flathead River, which may encourage residence by northern pike and largemouth bass. The extent of predation by these two effective predators on bull trout and westslope cutthroat is not known.

Radio-telemetry will be used to determine the movement, distribution and habitat use of predator and prey species. A state-of-the-art radio-telemetry system, installed in 1996 and 1997 along the Flathead River, will be used to monitor radio-tagged fish movements and distribution. Aerial surveys will also be conducted at periodic intervals to verify ground station data and obtain specific fish locations. These locations will be mapped and compared by species to determine habitat overlap and thereupon predation potential and competition. By correlating season and habitat use with flow and temperature, managers may be able to influence fish movements and distribution thereby reducing predator-prey interactions.

Only a small percentage of historic spawning and rearing streams in the north and middle forks of the Flathead River are currently being utilized by bull trout and cutthroat trout due to poor land management practices. In the south fork, bull trout habitat assessment and population inventories were conducted on tributaries to Hungry Horse Reservoir by Hungry Horse Mitigation crews in the mid 1980's. This work along with redd counts in 1993 identified Wounded Buck, Wheeler, Sullivan and Quintonkin Creeks as spawning and rearing streams for reservoir fish. These tributaries were recommended for long term monitoring and are regarded as population-index areas. Bull trout redd counts and substrate scoring will be conducted prior to any habitat improvement activities in these streams, and will serve as baseline data to measure the success of habitat improvement work. Habitat improvement projects will be initiated to reconstruct degraded stream beds, install woody debris devices to catch sediment and restore eroded banks in some of these streams.

An additional improvement project will entail construction of a shallow, flow-through impoundment, in the upper end of Hungry Horse Reservoir, to increase the production of macro-invertebrates that are lost during annual drawdown. An increase of insect production would provide additional food for westslope cutthroat and juvenile bull trout; this should increase growth rates and survival of these species in the reservoir.
During periods of reservoir drawdown (spring and fall), shallow basins would warm thereby stimulating the production of insects. Macro-invertebrates would be delivered directly into the reservoir by 1)outflow from the basins, 2)terrestrial insect deposition and 3)inundation of the basins as the reservoir level rises.

Long term survey data indicate that westslope cutthroat trout populations in the south fork have remained relatively stable; whereas, populations in the middle and north forks of the Flathead River have declined from historic levels. Increasing the quantity of suitable spawning and rear habitat available to these native fish species should increase the numbers of juveniles returning to the lake. Population estimates are needed to assess the effectiveness of habitat restoration and passage improvement projects ongoing under mitigation.

b. Proposal objectives.

1. Assess the abundance, distribution, movements and food habits of lake trout in the main stem, north and middle forks of the Flathead River.
This objective began in December 1994 and will end December 1999. Radio-transmitters will be deployed until December 1998. Data on distribution will be collected until December 1999. Results obtained from this objective will measure the influence of selective withdrawal on non-native lake trout in the Flathead River. Results of this objective will be published in a report to BPA and peer reviewed journals. This report will be available to all interested agency and citizen groups.

2. Assess distribution and movements of juvenile and sub-adult bull trout in the main stem, north and middle forks of the Flathead River.

This objective began July 1997 and will end January 2001. Radio-transmitters will be deployed until October 1999. Data on distribution will be collected until January 2001. Results obtained from this objective will measure the extent of species interactions and habitat overlap of bull trout with non-native predators. Results of this objective will be published in a report to BPA and peer reviewed journals. This report will be available to all interested agency and citizen groups.

3. Assess distribution and movements of westslope cutthroat trout in the main stem, north and middle forks of the Flathead River.
This objective began in January 1998 and will end June 2001. Radio-transmitters will be deployed until April 2000. Data on distribution will be collected until June 2001. Results obtained from this objective will measure the extent of species interactions and habitat overlap of westslope cutthroat trout with non-native predators. Results of this objective will be published in a report to BPA and peer reviewed journals. This report will be available to all interested agency and citizen groups.

4. Conduct westslope cutthroat trout population assessments in the south, middle and north forks of the flathead River in cooperation with MFWP management staff and Hungry Horse Mitigation Crew (project 9101903).
This objective began in August 1997 and will end August 2001. Results obtained from this objective will be used to measure the status of westslope cutthroat trout populations. Results of this objective will be published in a report to BPA. This report will be available to all interested agency and citizen groups.

5. Assess movements, distribution and food habits of predators in Halfmoon, Church and Fennon Sloughs and the main stem Flathead River.
This objective began in April 1997 and will end December 1999. Radio-transmitters will be deployed until November 1998. Data on distribution will be collected until December 1999. Results obtained from this objective will measure the extent of species interactions and habitat overlap of bull trout and westslope cutthroat trout with non-native predators. Results of this objective will be published in a report to BPA and peer reviewed journals. This report will be available to all interested agency and citizen groups.

6. Create shallow impoundment-basins in the upper reaches of Hungry Horse Reservoir in cooperation with BOR and Hungry Horse Mitigation Crew to increase the production of macro-invertebrates.
This objective began in May 1997 and will end November 2000. Results obtained from this objective will provide juvenile bull trout and westslope cutthroat trout with additional food sources. Results of this objective will be published in a report to BPA. This report will be available to all interested agency and citizen groups.

7. Collect species micro-habitat data required by Instream Flow Incremental Methodology (IFIM) project on the Flathead River.

This objective will begin in June 1998 and will end November 2000. Results obtained from this objective will provide documented habitat parameters used in IFIM model for the Flathead River. Results of this objective will be published in a report to BPA. This report will be available to all interested agency and citizen groups.

8. Monitor kokanee salmon spawning runs in the main stem Flathead River.
This objective began in October 1997 and will end December 1998. Results of this objective will measure the survival of kokanee planted in Flathead Lake under the Hungry Horse Mitigation Project. Results of this objective will be published in a report to BPA. This report will be available to all interested agency and citizen groups.

9. Map Flathead River and sloughs using Global Positioning System (GPS) to be conducted in cooperation with Montana Rivers Information System (MRIS).
This objective will begin in April 2000 and end November 2001. Results of this objective will replace outdated USGS quad maps of the 1960's and 1970' s used by MFWP. These maps will provide this project with accurate and meaningful maps of radio-telemetry data collected through the objectives above. Results of this objective will be published in a report to BPA. This report will be available to all interested agency and citizen groups.

10. Examine habitat improvement potential and project design in the main stem Flathead River to be conducted in cooperation with MFWP's Urban Fishery Program.
This objective will begin April 2000 and end December 2001. Results of this objective will measure the potential of a mainstem Flathead River tributary (Rose Creek) for habitat improvement for westslope cutthroat trout. Results of this objective will be published in a report to BPA. This report will be available to all interested agency and citizen groups.

11. Examine habitat improvement potential and project design in bull trout spawning and rearing streams to be conducted in cooperation with Hungry Horse Mitigation Crew.
This objective began in June 1995 and will end November 2001. Results of this objective will measure the potential of Hungry Horse tributaries for habitat improvement for bull trout and westslope cutthroat trout. Results of this objective will be published in a report to BPA. This report will be available to all interested agency and citizen groups.

12. Implement actions determined in objective 11.
This objective will begin in April 1999 and end November 2001. Results of this objective will provide increased spawning and rearing habitat for bull trout and westslope cutthroat and ultimately boost recruitment to the reservoir.

c. Rationale and significance to Regional Programs.

Hydropower impacts on the Flathead system fisheries have been well documented i.e. Fisheries Mitigation Plan for Losses Attributable to the Construction and Operation of

Hungry Horse Dam (MFWP & CSKT 1991 and 1993). The Flathead system has sustained fish losses both above and below Hungry Horse Dam due to the dam's construction and operation. However, a milestone in the hydropower-fishery scenario was achieved for the Flathead River in 1995 through the installation of a selective withdrawal system in Hungry Horse Dam. This project will not only monitor the impact of selective water withdrawal operations, but will also provide operation recommendations to optimize downstream fisheries in the Flathead River and in Flathead Lake. With the current status of bull trout and their possible listing as an endangered species by the U.S. Fish and Wildlife Service, optimizing selective water withdrawal regimes could greatly benefit this species as well as westslope cutthroat trout (another species of special concern). In addition, it is hypothesized that selective withdrawal will reduce predation on these two species by making the lower river environment unsuitable for the non-native pisciverous lake trout. This objective addresses a basic concern of the Bull Trout Recovery Program i.e. *Assessment of Methods for Removal or Suppression of Introduced Fish to Aide in Bull Trout Recovery.* Radio-telemetry work, coupled with the IFIM program, should accomplish this objective.

This project compliments the State of Montana policy to enhance and protect native trout species. On-the-ground habitat reconstruction work above Hungry Horse Dam will also make a significant impact for enhancing native trout. Above Hungry Horse Dam, wetlands development will increase food available for westslope cutthroat and bull trout. Stream restoration plans in Hungry Horse tributaries will enhance spawning and rearing for these two species of special concern and also compliment the Flathead National Forest basin-wide master plan (Brannon 1985) as well as the Flathead Basin Commission's Monitoring Master Plan of 1985.

Enhancing native species in the lower Flathead River compliments efforts of 1) Montana Bull Trout Restoration Plan, 2) Montana Westslope Cutthroat Trout Restoration Plan and 3) the MFWP Director's initiative to provide "Urban Fisheries" since the river flows so close to the communities of Columbia Falls, Kalispell and Bigfork.

d. Project history

This is an ongoing mitigation program: BPA Project 94-10 entitled Mitigation for Excessive Drawdowns at Hungry Horse and Libby Reservoirs. It has been underway since 1994 (4 yrs).

This project began as a result of language in the 1987 Fish and Wildlife Program (measures 903(a) and (b), and 903(b)(1)(D)) which stated that if drawdown limits were exceeded for power purposes (85 feet at Hungry Horse and 90-110 feet at Libby), BPA shall fund the mitigation of fishery losses caused by reservoir drawdowns in excess of the limits. In 1995, the Fish and Wildlife Program was amended to adopt and implement Integrated Rule Curves (IRCs) at Hungry Horse and Libby Dams. The earlier drawdown limits remain in effect until the IRCs are implemented. MFWP and CSKT proposed a program to mitigate damages to the fishery resources in Hungry Horse and Libby

Reservoirs sustained during the period 1987 through 1991 (MFWP and CSKT 1993). BPA agreed to fund a three year project that began in November 1994. Funding was provided by BPA Power Supply rather than Fish and Wildlife Program dollars. Thus, this project has been funded under a different process than projects funded under the Fish and Wildlife Program.

The established drawdown limits were again exceeded for power purposes after the original excessive drawdown mitigation proposal was submitted to BPA. Record breaking drawdowns occurred in two years at Hungry Horse (1993, a 188-ft drawdown; 1994, a 173.8-ft drawdown) and a deep draft (1993, a 136-ft drawdown) occurred at Libby Reservoir. MFWP and CSKT documented fishery losses incurred by these extreme reservoir drawdowns and requested BPA fund mitigative actions (MFWP and CSKT 1997). The initial year of the project (FY98) was funded by Power Supply. Funding for future years will be reviewed and prioritized under the Fish and Wildlife Program (Bob Lohn, BPA personal communications and contract stipulation).

e. Methods.

Objective 1,2,3,5.

Radio-telemetry will entail using radio transmitters to track the movements of juvenile and sub-adult bull trout, sub-adult and adult westslope cutthroat trout and adult lake trout within the Flathead River system. The main assumption is that tagged and non-tagged fish behave similarly. The surgical sequence occurs as follows: fish are capture by angling or netting, determined to be in good condition, anesthetized in a solution of ms-222, measured and weighed, a scale sample is taken, the fish's gills are kept in ms-222, an incision is made in the ventral side of the fish longitudinally from just anterior of the pelvic fins for two inches up toward the head, a large-diameter hypodermic needle is inserted anteriorly through the skin into the body cavity posterior to the pelvic fins, the 12-inch long wire radio-antenna is inserted into the end of the needle while the needle is still in the body cavity, the needle is then withdrawn and the antenna extends posteriorly outside the body cavity, the radio is implanted in the body cavity, surgical staples are used to initially close the incision, sutures are then used to fully close the incision, betadine solution is applied to cleanse the outside of the incision, finally the fish is placed in fresh water to recover before release.

The number of lake trout with radios will be maintained at 35; reasoning for this number was determined in part by the cost of the transmitters (~$200 each), the capacity and usefulness of the radio receiver when locating fish and the size of the river system. Lake trout must be >445g. Radios used for bull trout will be limited to 30. Ten bull trout radios will be used on juveniles (<120g) that are emigrating from spawning streams, and a maximum of 20 will be used on sub-adults (445-1360g) that are inhabiting the main stem Flathead River. Thirty westslope-cutthroat radios will be deployed; a maximum of 10 radios will be implanted into adult cutthroat (>445g) and the remainder will be implanted into sub-adult cutthroat (150-260g). A maximum of 24 radios will be used to monitor northern pike (>800g) and largemouth bass (>445g) in the lower Flathead River and

sloughs. Two radios will implanted into northern pike in each slough. Two radios will implanted into largemouth bass in each slough.

Radio tracking will be accomplished with a Lotek data-logging receiver via weekly airplane flights and permanent ground stations (PSTs) set up along the Flathead river to record fish passage. PSTs record fish passage, time and date; this data is downloaded weekly into a laptop computer. PST data will cut down on the cost of unnecessary flights over sections of river that are void of radio-implanted fish. If an aerial survey covers the study area and does not pick up all the implanted fish, it is assumed that the undetected transmitters are outside the study area. Locations of implanted fish are recorded on a Corvallis Microtechnology Global Positioning System (MC-GPS).This unit integrates a hand held computer with a GPS. The radio-telemetry location data are then downloaded onto a MC-GPS mapping program that is installed on a personal computer. Data points are then graphically represented on a map of the Flathead River System and can be used to calculate distances traveled by implanted fish between monitoring dates.

Food habits will be collected from lake trout found in the river. This entails using angling, netting and creeling methods to obtain lake trout. The fish are killed first, then the body cavity is opened with a knife. The entire stomach section is removed intact, slit open and placed in plastic sample jars. Labels with pertinent information and a solution of 95% ethanol are placed in the jar. Samples are kept in storage until winter, when there is time for laboratory analysis. Diet items are separated and keyed out as far as distinguishing marks allow, using a dissecting scope. Similar species are enumerated, and each item is measured for length and wet weight. The data is then entered into a computer spreadsheet/database. Frequency of occurrence is then calculated to show trends in prey selection and preference.

Objective 4.

Westslope cutthroat trout population-estimates will be accomplished using standard fisheries mark-recapture techniques. A section of stream is marked, and fish are angled from the section for a specific time period. Each fish is marked using either a floy or ribbon tag and immediately released back into the water. A 24-hour period of time is allowed for the fish to redistribute within the section. Snorkeling is then used to visually "recapture" the fish within the section. Estimates can then be calculated and compared to previous seasons. Assumptions include; marked fish, during the period between release and recapture, suffer no greater mortality nor emigrate further than unmarked fish; no marks are lost nor are any recaptured marked fish overlooked; marked fish are "caught" at the same rate as unmarked fish; marked fish are randomly distributed or if not, the recaptures are; that there will have been no additions to the population(Everhart et al, 1975). These sections of stream are within the Bob Marshall and Great Bear Wilderness systems. The remote aspect of the area and restriction on mechanical devices within the wilderness preclude using other sampling techniques.

Objective 6.

The methodology for the impoundment project will entail expanding a test impoundment on the Hungry Horse Reservoir to a larger scale. A small project was completed at the mouth of Crossover Creek in 1997 to test the porosity of the soils and flow of the stream.

Objective 8.
Historic kokanee salmon spawning sites in the Flathead River will be monitored during fall months to check for the presence of this recreationally important species. Numbers of kokanee in Flathead Lake dropped precipitously in the late 1980's, and have not recovered since. An augmentation program has been planting fish in the lake in recent years, and by monitoring spawning sites, we can check the success of this program. A jet boat with three people scanning the water is used to visually check for the presence of kokanee.

Objective 9.
Mapping of the Flathead River and associated sloughs will be done concurrent with other tasks. This will be accomplished using a hand held Global Positioning system unit. This will be completed using a boat to follow shore line contours of the river while employing the GPS unit to acquire "way points" which can then be downloaded on a computer. These data points are then entered into special software program that can produce very detailed, accurate maps of the river system. This will replace USGS quad maps made in the 1960's and 1970's.

Objective 10, 11, 12.
Habitat improvement projects will involve selecting degraded habitat areas along bull trout and westslope cutthroat trout spawning and rearing streams, documenting degradation, determining present fish usage, applying habitat improvements, and monitoring fish usage after improvements are made. Many of the problem areas have deeply eroded, exposed banks that are slumping sediment directly into the streams. Bank stabilization using grass seed and willow cuttings would be used to stop the erosion and large woody debris piles would be installed to trap sediment within the stream. Electrofishing would be used to determine the amount of fish using the stream before and after improvements are made.

f. Facilities and equipment.

All offices, equipment, and facilities are located at the MFWP regional headquarters in Kalispell, Montana. This 5 acre complex, built in 1990, houses ~ 55 MFWP employees in addition to BPA project personnel. Facilities include several boat sheds, a machine shop, wet laboratory, field prep room, storage buildings for project equipment, and office space for all staff. Other specialized equipment include a 17 foot jet boat with outboard designed for running in shallow rivers like the North and Middle Forks of the Flathead River, three Merwin traps, three radio-telemetry ground stations each with a Lotek data logging receiver, one portable Lotek receiver for aerial surveys, one GPS unit, laptop computer for downloading data from ground stations and GPS unit, microscopes, cameras, and project vehicles from the MFWP motor pool. The Fisheries and Parks

divisions have other specialized equipment available when occasionally needed for projects: boom trucks, dump trucks, trailers, front loaders, and additional boats and vehicles, ect.

This project has sufficient computer and communications equipment. In addition, the office houses the Geographic Information Services Unit (GIS support) for the state. This unit frequently assists this project in GIS, GPS and mapping applications. They also manage the Montana Rivers Information System (MRIS).

g. References.

Brannon, E.B. 1985. Forest Plan: Flathead National Forest. United States Forest Service, Kalispell, Montana.

Carty, D., W. Fredenberg, L. Knotek, M. Deleray and B. Hansen. 1997. Hungry Horse Dam Mitigation: Kokanee stocking and monitoring in Flathead Lake. Annual progress report-1996. BPA project numbers 9101901, 9101903, and 9101904. Submitted to Bonneville Power Administration. 35pp.

Chisolm, I., and P. Hamlin.1987. 1985 Libby Reservoir Angler Census: May 13 - October 31, 1985. Montana Fish, Wildlife and Parks for Bonneville Power Administration, Portland, OR. 45pp.

Christenson, D.J., R.L. Sund and B. Marotz.1996. Hungry Horse Dam's successful withdrawal system. Hydro Review/May 1996. XV(3):10-15.

Council. 1987. Northwest Power Planning Council Fish and Wildlife Program.

Council 1994. Northwest Power Planning Council Fish and Wildlife Program.

Courtois, L.A. 1981. Lightweight, adjustable and portable surgical table for fisheries work in the field. Progressive Fish-Culturist 43:55-56.

Dalbey, D., J. DeShazer, L. Garrow, G. Hoffman and T. Ostrowski.1997. Quantification of Libby Reservoir levels needed to maintain or enhance reservoir fisheries: methods and data summary, 1988-1996. DRAFT report to Bonneville Power Administration. 70pp.

Deleray, M., T. Weaver and W.L. Knotek. 1997. Statewide fisheries investigations: survey and inventory of coldwater and warmwater ecosystems. Flathead Lake-River

System Study, F-78-R-3, Job No. V-a. July 1, 1995 through June 30, 1996. Montana Fish, Wildlife and Parks, Kalispell, Montana.

Deleray, M., W. Fredenberg, and B. Hansen. 1995. Kokanee stocking and monitoring, Flathead Lake-1993 and 1994. BPA Project No. 91-19. Montana Fish, Wildlife and Parks, Kalispell, Montana. Submitted to Bonneville Power Administration. 46pp.

Everhart, W. H., A. W. Eipper and W. D. Youngs. 1975. Principles of Fisheries Science. Cornell University Press, Ithaca, NY.

Flathead Basin Commission. 1995. Monitoring master plan for the Flathead Basin. Kalispell, Montana.

Flathead Basin Commission. 1997. Biennial report: 1995-96. Kalispell, Montana.

Fraley, J., B. Marotz, J. Decker-Hess, W. Beattie and R. Zubik. 1989. Mitigation, compensation, and future protection for fish populations by hydropower development in the in the upper Columbia System, Montana, U.S.A. Regulated Rivers: Research & Management 3:3-18.

Hansen, B., J. Cavigli, M. Deleray, W. Fredenberg, and D. Carty. 1996. Hungry Horse Dam fisheries mitigation: kokanee stocking and monitoring in Flathead Lake-1995. BPA Project numbers 91-19-01, 91-19-03, 91-19-04. Confederated Salish and Kootenai Tribes, Pablo, Montana. Submitted to Bonneville Power Administration. 25pp.

Hart, L. G., and R. C. Summerfelt. 1975. Surgical procedures for implanting ultrasonic transmitters in flathead catfish(Polyodictis olivaris). Transactions of the American Fisheries Society 104:56-59.

Hauer, F. R., J. T. Gangemi and J. A. Stanford. 1994. Long-term influence of Hungry Horse Dam operation on the ecology of macrozoobenthos of the Flathead River. Prepared for Montana Fish, Wildlife and Parks, Special Projects Bureau, Kalispell, Montana.

Heezen, K. L., and J. R. Tester. 1967. Evaluation for radio tracking by triangulation with special reference to deer movements. Journal of Wildlife Management 31:124-141.

Henderson, H. F., A. D. Hasler, and G. G. Chipman. 1966. An ultrasonic transmitter for use in studies of movements of fishes. Transactions of the American Fisheries Society 95(4):350-356.

Hungry Horse Implementation Group. 1994. Hungry Horse Dam Fisheries Mitigation Biennial Report, 1992-1993. Prepared for Bonneville Power Administration. 15pp.

ISAB. 1997. Ecological impacts of the flow provisions of the Biological Opinion for endangered Snake River salmon on resident fishes in the Hungry Horse, and Libby

systems in Montana, Idaho, and British Columbia. Independent Scientific Advisory Board. Report 97-3 for the Northwest Power Planning Council and National Marine Fisheries Service. Portland, OR.

Johnson, J.H. 1971. Fish-borne transmitters. Underwater Telemetry Newsletter 1(2):1, 3-4.

Knotek, W. L., M. Deleray, and B. Marotz. 1997. Fish passage and habitat improvement in the upper Flathead River Basin. Montana Fish, Wildlife and Parks, Kalispell, Montana. Prepared for Bonneville Administration. 60pp.

Malta, P., S. F. Glutting, R. G. Hunt, B. L. Marotz, W. L. Knotek, and T. Weaver. 1997. Mitigation for excessive drawdowns at Hungry Horse Reservoir. Montana Fish, Wildlife and Parks, Kalispell, Montana. Annual report prepared for Bonneville Power Administration. In prep.

Marotz, B. and J. DosSantos. 1993. Fisheries losses attributable to reservoir drawdown in excess of limits stated in the Columbia Basin Fish and Wildlife Program: Hungry Horse and Libby Dams. Montana Fish, Wildlife and Parks and Confederated Salish and Kootenai Tribes. Proposal to Bonneville Power Administration for the Period 1987 through 1991.

Marotz, B. And J. Fraley. 1986. In stream flows needed for successful migration and rearing of rainbow and westslope cutthroat trout in selected tributaries of the Kootenai River. Montana Fish, Wildlife and Parks for Bonneville Power Administration. 137pp.

Marotz, B., B. Hansen and S. Tralles. 1988. In stream flows needed for successful migration and rearing of rainbow and westslope cutthroat trout in selected tributaries of the Kootenai River. Montana Fish, Wildlife and Parks for Bonneville Power Administration. 137pp.

Marotz, B., D. Gustafson, C. Althen, and B. Lonon. 1996. Model development to establish Integrated Operation Rule Curves for Hungry Horse and Libby Reservoirs, Montana. Montana Fish, Wildlife and Parks report for Bonneville Power Administration, Portland, OR DOE/BP-92452-1. 114pp.

Marotz, B. L., C. L. Althen, and D. Gustafson. 1994. Hungry Horse Mitigation: aquatic modeling of the selective withdrawal system - Hungry Horse Dam, Montana. Montana Department of Fish, Wildlife and Parks. Prepared for Bonneville Power Administration. 36pp.

Marty, G. D., and R.C. Summerfelt. 1986. Pathways and mechanisms for expulsion of surgically implanted dummy transmitters from channel catfish. Transactions of the American Fisheries Society 115:577-589.

May, B., S. Glutting, T. Weaver, G. Michael, B. Marotz, P. Suek, J. Wachsmuth and C. Weichler. 1988. Quantification of Hungry Horse Reservoir water levels to maintain or enhance reservoir fisheries. Montana Department of Fish, Wildlife and Parks, Kalispell Montana. Annual report prepared for Bonneville Power Administration. 68pp.

McNeil, W. J. and W. H. Ahnell. 1964. Success of pink salmon spawning relative to size of spawning bed materials. United States Fish and Wildlife Service, Special Scientific Report. Fisheries 468. 15pp.

Montana Bull Trout Restoration Team. 1997. Montana bull trout restoration plan. Prepared for Montana Fish, Wildlife and Parks, Helena, Montana.

Montana Bull Trout Scientific Group. 1995a. Flathead River drainage bull trout status report. Prepared for the Montana Bull Trout Restoration Team. 49pp.

Montana Bull Trout Scientific Group. 1995b. South Fork Flathead River drainage bull trout status report. Prepared for Montana Bull Trout Restoration Team. 33pp.
MDFWP, CSKT and KTOI. 1997. Fisheries mitigation and implementation plan for losses attributable to the construction and operation of Libby Dam. Draft Report: Montana Department of Fish, Wildlife and Parks, Confederated Salish and Kootenai Tribe and the Kootenai Tribe of Idaho. Prepared for Bonneville Power Administration. Project No. 83-467.

Montana Department of Fish, Wildlife and Parks and Confederated Salish and Kootenai Tribe. 1991. Fisheries mitigation plan for losses attributable to the construction and operation of Hungry Horse Dam. Montana Department of Fish, Wildlife and Parks and Confederated Salish and Kootenai Tribe, Kalispell and Pablo, Montana. 71pp.

Montana Department of Fish, Wildlife and Parks and Confederated Salish and Kootenai Tribes. 1993. Hungry Horse Dam fisheries mitigation implementation plan. Montana Department of Fish, Wildlife and Parks and Confederated Salish and Kootenai Tribe, Kalispell and Pablo, Montana, 43pp.

Montana Department of Fish, Wildlife and Parks and Confederated Salish and Kootenai Tribes. 1991. Fisheries mitigation plan for losses attributed to the construction and operation of Hungry Horse Dam. 71pp.

Montana Department of Fish, Wildlife and Parks and Confederated Salish and Kootenai Tribes. 1993. Hungry Horse Dam Fisheries Implementation Plan. 50pp.

Montana Department of Fish, Wildlife and Parks and Confederated Salish and Kootenai Tribes. 1997. Fisheries losses attributable to reservoir drawdown in excess of limits in the Columbia Basin Fish and Wildlife Program: Hungry Horse and Libby Dams 1991-1993.

Montana Westslope Cutthroat Trout Recovery Team. In Preparation. Montana westslope cutthroat trout recovery plan. Prepared for Montana Fish, Wildlife and Parks, Helena, Montana.

Morton, W. M. 1955. Report on field trip, June 13 to 17, 1955, to study culverts blocking spawning cutthroat trout in Hungry Horse Reservoir, Montana. MFWP file report. 18pp. (Photos included).

Muench, B. 1958. Quinaldine, a new anesthetic for fish. Progressive Fish-Culturist 20(1):42-44.

Mulford, C. J. 1984. Use of surgical skin stapler to quickly close incisions in striped bass. North American Journal of Fisheries Management 4:571-573.

Read, D., B. B. Shepard, and P. J. Graham. 1982. Fish and habitat inventory of streams in the North Fork Drainage of the Flathead River. Flathead River Basin Environmental Impact Study. Prepared for Montana Fish, Wildlife and Parks, Kalispell, Montana for the Environmental Protection Agency. 181pp.

Rosgen, D. L. 1996. Applied River Morphology. Wildland Hydrology, Pagosa Springs, Colorado.

Ross, M. J., and J. H. McCormick. 1981. Effects of external radio transmitters on fish. Progressive Fish-Culturist 43:67-72.

Schramm, H. L., Jr., and D. J. Black. 1984. Anesthesia and surgical procedures for implanting radio transmitters into grass carp. Progressive Fish-Culturist 46:185-190.

Shepard, B. B., and P. J. Graham. 1982. Completion report. Monitoring spawning bed material used by bull trout on the Glacier View Ranger District, Flathead National Forest, MFWP, Kalispell, Montana. 37pp.

Snelson, S., C. Mulfield and B. Marotz. 1997. Mitigation for excessive drawdown at Libby Reservoir. DRAFT Annual Report 1996. BPA Project number BPA 94-10.
Stanford, J. A., B. K. Ellis, J. A. Craft and G. C. Poole. 1997. Water quality data and analyses to aid in the development of revised water quality targets for Flathead Lake, Montana. Report prepared for the Flathead Basin Commission, Kalispell, Montana.

Stasko, A. G. 1971a. Bibliography of underwater telemetry in biological applications. Underwater Telemetry Newsletter 1(1):6-9.

Stasko, A. G. 1971b. People and projects in underwater telemetry. Underwater Telemetry Newsletter 1(2):5-14.

Stasko, A. G. 1971c. Review of field studies on fish orientation. Annuals New York Academy of Science 188:12-29.

Summerfelt, R. C. and L. Hart. 1972. Performance evaluation of a 74 kilocycle second transmitter for behavioral studies on reservoir fishes. Proceedings of the Southeast Association Game and Fish Commission 25(1971):607-622.

Weaver, T. M., and J. J. Fraley. 1991. Fisheries habitat and fish populations. Flathead Basin Forest Practices Water Quality and Fisheries Cooperative Program, Flathead Basin Commission, Kalispell, Montana. 47pp.

Weaver, T. M., and J. J. Fraley. 1993. A method to measure emergence success of westslope cutthroat trout fry from varying substrate compositions in a natural stream channel. North American Journal of Fisheries Management 13:817-822.

Weaver, T. M., J. J. Fraley, and P. J. Graham. 1983. Fish and habitat inventory of streams in the Middle Fork of the Flathead River. Flathead River Basin Environmental Impact Study. Prepared for Montana Department of Fish, Wildlife and Parks, Kalispell Montana for the Environmental Protection Agency. 229pp.

Weisberg, S., and R. V. Frie. 1987. Linear models for growth of fish. Pages 127-143 *in* R. C. Summerfelt and G. E. Hall, eds. Age and growth of fish. Iowa State University Press, Ames, Iowa.

Williams, D. F., and R. Roaf. 1973. Implants in surgery. Saunders, Philadelphia.

Winter, J. D. 1983. Underwater Biotelemetry. Pages 371-396 in L. A. Nielsen and D. L. Johnson, editors, Fisheries Techniques. American Fisheries Society, Bethseda, Maryland.

Zimmerman, F., and C. Bercy. 1981. Effets de la fixation interne d'emetteurs der tracking chez la truite. [Effects of internal tracking transmitters on behavior of trouts] Acta Oecologica Applicata 2:49-62.

Zippen, C. 1956. An evaluation of the removal method of estimating animal populations. Biometrics 12:163-169.

Section 8. Relationships to other projects

This project compliments the larger Hungry Horse Mitigation Program addressing operational mitigation (Integrated Rule Curve Refinement and assessment: measure 10.3A of the FWP). Biological data compiled by this project will be used to develop the biological component of the IFIM-based Flathead River Model. The physical framework of this effort will be completed by project 9502500. This cooperative effort will compliment and extend the utility of the reservoir model (HRMOD) and the thermodynamics component (projects 9101903 and 8346500). Combined results will

allow for accurate assessment of the physical and biological effects of various river operations in the Flathead system, and will provide a tool for future monitoring actions (project 9501200). Results will help federal dam operators and fisheries managers balance dam operations for the greatest benefit, by balancing fisheries concerns with power production and flood control. The ability to assess tradeoffs between reservoir and river operations, both locally and system wide, is especially important now that many Columbia River fish species have been petitioned or proposed for listing, or listed under ESA. Also, previous investments in hydropower mitigation should be protected, with special consideration when changes in system operation are implemented. Changes in dam operation for recovery actions in the lower Columbia have been shown to impact resident fish in the headwaters (ISAB 1997) and must be balanced to benefit all native fish species. Actions taken, must also be affordable to the public will likely stop the effort. To do this, decision makers must have tools to assess trade-offs and make wise choices.

This project will identify the relationships between water temperature, water flow, and the movements of native species and large, non-native predators in the main Flathead River. This information will allow dam operators and fish managers to provide river operations that facilitate native-species recovery efforts in the Flathead drainage. These relationships will be used to develop thermal and flow regimes below Hungry Horse Dam that will enhance habitat suitability and help with native species recovery. Activities will include radio locations for bull trout, lake trout and other species to provide habitat suitability indices as outlined in the objectives for the Flathead IFIM Project.

Project personnel will also work directly with the Hungry Horse Mitigation Crew to create impoundment basins in the upper reaches of Hungry Horse Reservoir. These basins will increase the production of macro-invertebrates available to native cutthroat trout. In addition, this project will work cooperatively with the Hungry Horse Mitigation Crew to determine habitat improvement potential, and develop project design, for bull trout spawning and rearing streams.

This project collaborates with the Hungry Horse Dam Mitigation Project above Hungry Horse Dam restoring previously used trout habitat to functional condition through stream rehabilitation and fish passage repairs. The two projects compliment each other in that they are concentrating on restoring and maintaining native trout populations in the Flathead River System. Both projects are simultaneously monitoring the effects of selective withdrawal but are addressing different parameters.

Compliments and collaborates with Hungry Horse Dam Selective Withdrawal Project monitoring its effectiveness and identifying optimal withdrawal regimes that could benefit native species in the Flathead River System.

The radio-telemetry work of this project will identify migration habits, habitat preferences and spacial distribution of predators and prey species in the Flathead River System. When these inter-specific requirements are more clearly identified, selective withdrawal

can be used as an invaluable tool for managing these species in the Flathead River System.

Project objectives are to identify, enhance and maintain native trout species in the Flathead River System. These objectives compliment the concerns and efforts of the U.S. Fish and Wildlife Service, the Montana Bull Trout Recovery Team and the Flathead Basin Commission. These agencies all advocate the recovery of native species in the Flathead, particularly bull trout and westslope cutthroat trout.

Compliments U.S. Fish and Wildlife Service ESA listing investigations by identifying main-stem species interrelationships, migration patterns and predation.

Compliments Flathead Basin Commission plans calling for recovery of native species in the Flathead basin.

Compliments and collaborates with MFWP identifying lake trout, bull trout and westslope cutthroat migration and predation and setting harvest regulations.

Compliments Confederated Salish and Kootenai Tribe by enhancing native fish in the main stem Flathead and will directly impact the management decisions for Flathead Lake. Compliments U.S. Forest Service forest plan by enhancing native species through habitat restoration projects.

Section 9. Key personnel

Project Manager: Patrick R. Malta Title: Fish & Wildlife Technician FTE: 1.0

Project Duties: Write project proposals and grant applications; determine project direction and develop work plans and schedules by prioritizing tasks to meet contractual obligations; develop yearly budgets and monitor monthly budget analysis reports; write quarterly and yearly progress reports; write employee performance appraisal criteria and conduct performance evaluations. Work independently with minimal supervision conducting fisheries research on Flathead River and associated waters. Identifies and implements selected fish habitat and passage improvement projects. Supervise two Fish and Wildlife Technicians.

Qualifications: BS Degree. Fish and Wildlife Conservation major, Biology minor, and an additional twenty semester hours in business administration. Forty-eight (48) semester hours post graduate continuing education in Fish and Wildlife Management. Five plus years experience in fisheries with FWP and USFWS. Six plus years experience in wildlife with FWP. Two plus years experience in forestry with USFS and SCS. Interim project manager for the Northwest Montana Wildlife Habitat Enhancement: Hungry Horse Elk Mitigation Project in 1993. Project manager for Hungry Horse Dam Excessive Drawdown Mitigation Project since 1994.

Education:	B.S. Conservation - Northern Michigan University	1980
	Fish & Wildlife Management Classes - University of Montana	1982-1984
	Computer and Business Classes - Flathead Valley Community College	1988,1997

Current Employer:

11/94 to present	Fish and Wildlife Tech.	Montana Fish, Wildlife and Parks	Kalispell, MT

Previous Employment:

10/88 to 11/94	Wildlife Research Asst.	Montana Fish, Wildlife and Parks	Kalispell, MT
07/88 to 10/88	Fisheries Fieldworker	Montana Fish, Wildlife and Parks	Kalispell, MT
04/88 to 07/88	Wildlife Research Aid	Montana Fish, Wildlife and Parks	Kalispell, MT
11/87 to 03/88	Fisheries Fieldworker	Montana Fish, Wildlife and Parks	Kalispell, MT
04/87 to 10/87	Fisheries Fieldworker	Montana Fish, Wildlife and Parks	Kalispell, MT
05/86 to 11/86	Fisheries Fieldworker	Montana Fish, Wildlife and Parks	Kalispell, MT

Publications:

Casey, D., and P.R. Malta. 1992. Northwest Montana wildlife habitat enhancement: Hungry Horse elk mitigation project. Ann. Rept., FY92. MFWP, Kalispell. 66p.

Vore, J., and P.R. Malta. 1993. Northwest Montana wildlife habitat enhancement: Hungry Horse elk mitigation project. Ann. Rept., FY93. MFWP, Kalispell. 62p.

Vore, J., P.R. Malta, E. Schmidt. 1994. Hungry Horse habitat mitigation project. Ann. Rep., FY94. MFWP, Kalispell. 55p.

BRIAN MAROTZ

Fisheries Program Officer (0.10 FTE)
490 North Meridian Road
Kalispell, Montana 59901
Phone (406) 751-4546
Fax (406) 257-0349
E-mail marotz@digisys

Education

Master of Science – Fisheries Management
Louisiana State University - Baton Rouge, Louisiana.
Estuarine Biology

15 Credits: Gulf Coast Research Institute
Ocean Springs, Mississippi.
Marine Science

Bachelor of Science – Biology (Aquatic Sciences)
University of Wisconsin - Stevens Point, Wisconsin.
Freshwater Biology

16 Credits: S.E.A. Semester at Sea, Boston University
Woods Hole, Massachusetts
Marine Biology

Professional experienceexperience

1991-Present Fisheries Program Officer, Montana Fish, Wildlife & Parks
Kalispell, Montana
Duties: Supervise Special Projects Office, Hydropower Mitigation and Focus Watershed Programs.

1989 – 1991 Fisheries Biologist, Montana Fish, Wildlife & Parks
Kalispell, Montana
Duties: Hungry Horse Reservoir Research, Develop Hungry Horse Mitigation Program, Computer Modeling Flathead and Kootenai Drainages, Develop Integrated Rule Curves (IRCs) for Montana Reservoirs.

1985 – 1989 Fisheries Biologist, Montana Fish, Wildlife & Parks
Libby, Montana
Duties: Libby Reservoir Research, Kootenai Instream Flow Project, Computer Modeling Flathead and Kootenai Drainages, Develop Integrated Rule Curves (IRCs) for Montana Reservoirs.

1984 – 1985 Research Associate, Louisiana State University - Baton Rouge, Louisiana
Duties: Estuarine Research to control salt water encroachment to Estuarine Marsh on the Sabine National Wildlife Refuge. Developed Operating Plan for Water Control Structures to Allow Migration of Catadromous Fish and Crustaceans

Publications
Pertinent Publications Listed in this Document

Awards
1994 Governor's Award for Excellence in Performance as an Employee of the State of Montana

1994 Director's Award for Excellence as an Employee of Montana Fish, Wildlife & Parks

1989 Certified Fisheries Scientist
American Fisheries Society

Section 10. Information/technology transfer

Project results will be published in reports to BPA and, where applicable, peer reviewed journals. Quarterly progress reports are sent to all interested agency and citizens groups. Results of the program are frequently presented at professional meetings within and outside MFWP, and in the public arena through invited presentations, newsletters, and news coverage. MFWP currently supports a state-wide rivers database with information on streams, fisheries, species distribution, etc. This database is administered from within our office as is accessible through MFWP's Internet web site.